Installation Manual

Visionary green energy

JETION SOLAR

Installation Manual

Please read this manual carefully before installation and keep it for future reference.

Introduction

- Jetion Solar Photovoltaic modules consist of crystalline silicon solar cells, high transmission and low iron toughened glass, anti-aging EVA and high flame resistant backsheet,and anodized aluminum alloy frame.
- Jetion modules are qualified for national standard IEC 61215.2 and IEC 61730, which have passed examination of the authorisedty test center. Jetion modules can be used in roof solar systems,PV stations, communication stations, petrol, ocean, meteorological, traffic and PV buildings etc.
- We are committed to providing technical and installation support for our customers worldwide.
- This Installation Manual is applicable to the installation of the following Jetion modules:

JT***SFa/b JT***SAa/b JT***SBa/b
JT***SFc JT***SEc JT***SDc JT***SCc JT***SAc
JT***PFe JT***PEe JT***PDe JT***PCe JT***PAe
JT***SAa/b(Black) JT***SDc(Black) JT***SCc(Black)

Notes: 1. JT***SFa/b is used here as an example.
2. " *** " is the rated power of the related Jetion module.

- This manual contains important information regarding the in stallation, safe handling and maintenance of PV modules made by Jetion.
- All instructions should be read and understood prior to installing the modules. The installer should conform to all requirements in this manual. The appropriate local standards and regulations, construction rules and safety instructions should also be followed during installation. All work on a PV system must be carried out by appropriately qualfied engineers, who must be familiar with the mechanical and electrical requirements for such a PV system.

Disclaimer of liability

- The installation, handling and use of Jetion modules are beyond company control. Therefore, Jetion assumes no responsibility for loss, damage, injury or expense resulting from improper installation, handling, use or maintenance.

- Jetion reserves the right to update the product, specifications or this Installation Manual without prior notice.

1) Certificates requests

1.1) IEC 61730

Jetion modules are designed to fulfill the criteria of Application class A requirements according to IEC 61730-1. Modules rated for use in application class A may be used in systems operating at greater than 50V DC or 240W, where general contact access is anticipated. Modules qualified for safety through IEC 61730-1 and IEC 61730-2 within application class A are considered to meet the requirements for safety class.

1.2) UL

- The electrical characteristics are within +/- 10% of the rated values of Isc,Voc and Pmp under test conditions (irradiance of 100 mW/cm2, AM 1.5 spectrum,and cell temperature of 25°C).
- The stand-off height should be at least 100mm (3.94in), and the recommended stand-off height is 115mm (4.53in). If other mounting means are employed, this may affect the Listing For Fire Class Ratings.
- The modules have been evaluated by UL for a maximum positive or negative design loading of 30 lb/ft^2 (146.5 kg/m^2).
- Wiring methods should be in accordance with the NEC.
- For installation in Canada, the installation shall also be in accordance with CSA C22.1, safety Standards for Electrical Installations, Canadian Electrical Code, Part 1.

2) Installation requirements

2.1) Installation environment requirements

- Avoid shading:
  Even if the smallest local shelter/shadow (such as dust deposition) will also decrease the output power.
- Adequate ventilation:
  High temperature of the module may reduce the performance and output power of the module. Good ventilation can effectively avoid the overheating of PV modules.
- Others:
  - Do not install the module near inflammable gas (such as gas station, gas tank etc.)
  - Do not install the module near naked flame or flammable materials.
  - Do not install the module in a location with potential for extreme sand and dust damage.
  - Do not install the module in a location with extreme air pollution, such as chemical vapors,acid rain,and/or soot.
  - Do not expose the module to a laser source.

- Do not install the module in a location with extreme hail and/ or snow.
- Do not install the module in a location where it could be immersed in water or continually exposed to water from a sprinkler or fountain.
- Do not install the module in a marine environment and/or area where salty wind hit directly. It is recommended that the module be installed at least 500m from the sea.
- Environment temperature -20°C to 40°C.
- Operating temperature -40°C to 85°C.

2.2) Orientation and tilt for modules installation

- Solar modules produce the max power when they are pointed directly at the sun. In order to achieve maximum annual yield, optimum orientation and tilt of PV modules is necessary. The modules, which connected in a system, must be in same orientation and tilt, otherwise, it will lose the power because of the differences of sunshine radiation.
- The modules must be facing the north in the south hemisphere, and facing south in north hemisphere.
- For off-grid installations where the Jetion modules are attached to a permanently structure, the Jetion modules should be titled for optimum winter performance. As a rule, if the system power production is adequate in winter, it will be satisfactory during the rest of the year. The module tite angle is measured between the solar modules and the ground.

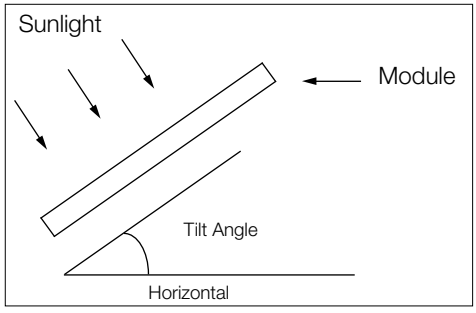


Fig. 1: Module Tilt Angle

RECOMMENDED TILT ANGLES FOR A FIXED SYSTEM	
SITE LATITUDE IN DEGREES	FIXED TILT ANGLE
0° to 15°	15°
15° to 25°	SAME AS LATITUDE
25° to 30°	LATITUDE + 5°
30° to 35°	LATITUDE + 10°
35° to 40°	LATITUDE + 15°
40° +	LATITUDE + 20°

Table 1: Module Tilt Angle

2.3) Materials requirements

- Support structure
  The support structure of the module is made of abrason proof, corrosion resistant and UV resistant materials which corresponds to the appropriate structural requirements. The mounting structure and the module attachments must be designed in accordance with the local wind and snow loads.
- Bypass diode
  Partial shading of an individual module can cause a reverse voltage across the shaded module. Current is then forced go through the shaded area by the other modules. When a bypass diode is wired in parallel with the series string, the forced current will flow through the diode and bypass the shaded module,thereby minimizing module heating and array current losses.
- Support structure
  In a system that uses a battery, blocking diodes are typically placed between the battery and the module output to prevent battery discharge at night and rainy weather. Diodes that are used as blocking diodes must have a:

a) Rated Average Forward Current [IF(AV)] above the maximum system current at he highest module operating temperature.
b) Rated Repetitive Peak Reverse Voltage (VRRM) above the maximum system voltage (Vmax) at the lowest module operating temperature (IEC: Vmax=1000V; UL: Vmax=600V).

- Battery
  When solar modules are used to charge batteries, the battery must be installed in a manner which will protect the performance of the system and the safety of its users. The battery should be away from the main flow of people and animal traffic. Select a battery site that is protected from sunlight, rain, snow, debris, and is well ventilated. Most batteries generate hydrogen gas when charging, which is explosive. Do not light matches or create sparks near the battery bank. When a battery is installed outdoors, it should be placed in an insulated and ventilated battery case specifically designed for the purpose.
- Cable and other components

a) Ensure that all components meet the requirements of the system´s maximum voltage, current, moisture and temperature when they are exposed to sunlight. We recommended that all wiring and electrical connections comply with the appropriate national electrical code.
b) Under normal condition,a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. Accordingly, the values of Isc and Voc marked on this module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor current ratings, fuse sizes and size of controls connected to the PV output. Refer to section 690-8 of the U.S. National Electric Code for an additional multiplying of 1.25 which may be applicable.
c) Only cables with one conductor are to be used.

d) The area of the cable mated with the connector is recommended to be 4~6 mm², length: 1000mm, temperature range: -40 to 90. The maximum series fuse IMax. Series fuse (Mono-125: IMax. Series fuse=10A Mono-156&Poly-156 IMax. Series fuse=15A) .

2.4) The requirements for different types of mount

- Ground mount
  Select the height of the mounting system to prevent the lowest edge of the module from being covered by snow for a long time in winter in areas that experience heavy snowfalls. In addition, assure the lowest portion of the module is placed high enough so that it is not shaded by sand and stone driven by wind.
- Roof mount

a) When installing a module on a roof or building, ensure that it is securely fastened and cannot fall as a result of wind or snow load.
b) The modules are supported parallel to surface of the building wall or roof. Clearance between the module frames and surface of the wall or roof is required to prevent wiring damage and to allow air to circulate behind the module.
The standoff height should be at least 100mm (3.94in). The recommended stand-off height is 115mm (4.53in).
c) The roof installation of modules may affect the fireproof performance of building structure.
d) The modules must be installed onto a Classified Roofing system. The modules are Class C. You can mount them over a Class C, B or A roof. The amount of area the modules cover may degrade the roof's original fire rating in some locations. Do not install modules on a roof or building during strong winds in case of accident.

- Pole mount
  When installing a module on a pool, choose a pole and module mounting structure that should will withstand anticipated winds for the area.

3) Mounting Methods

To prevent bending, vibration, mechanical stress or warpage, mount the module onto a flat contact surface. The minimal distance between mounted modules should be no less than 20 mm. Use all the mounting points provided and avoid direct contact between glass and metal (e.g. mounting rails).

- Option 1: Clamping Mounting
  The clamps must not overlap the glass or shade the module surface,or distort the frame.Recommended torque is 5Nm.

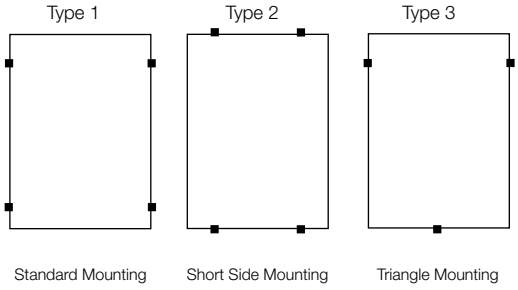


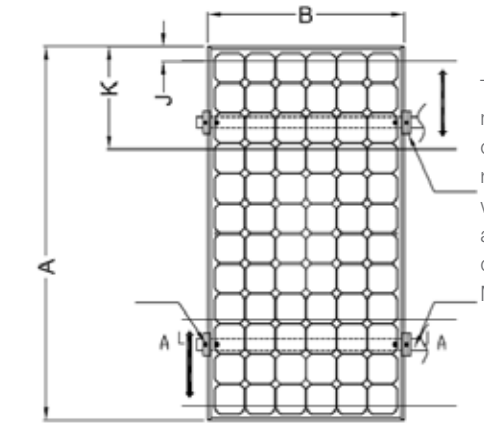
Fig. 2

Module Type	Frame	Type 1	Type 2	Type 3
JT***SFa/b	30mm	✓	△	×
JT***SAa/b JT***SAa/b(Black)	40mm	✓	△	×
JT***SC-Fc	40mm	✓	△	×
JT***SC-Dc(Black)	40mm	✓	△	×
JT***PC-Fe	40mm	✓	△	×
JT***PAe/JT***SAc	45mm	✓	△	×
JT***SBa/b	45mm	✓	△	×

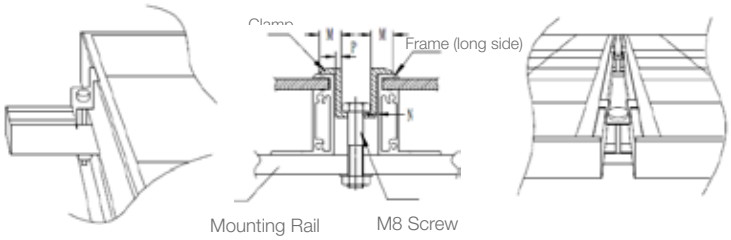
Table 2

Notes:
1) JT***SFa/b is used as an example.
2) Where "***" is the rated power of the Jetion module.
3) "✓" indicates 5400pa available; "△" indicates 2400pa is available; "×" indicates no allowed.
4) Different frame height should choose appropriate clamp and bolt.
5) Mechanical load test performed according to IEC standard, not applicable for UL products.

- Type 1: Standard Mounting



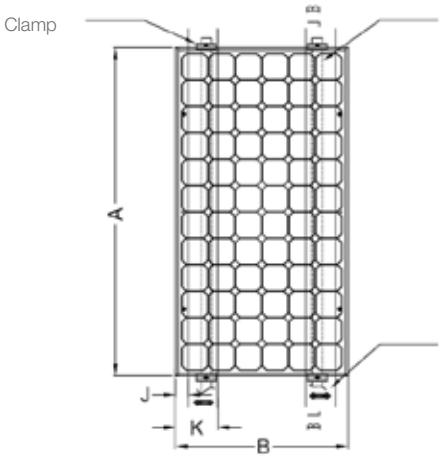
The movement of the mounting rail and the clamps center-line are recommended to be within the black arrow area. Please find specific data from Table 3.
Mounting Rail



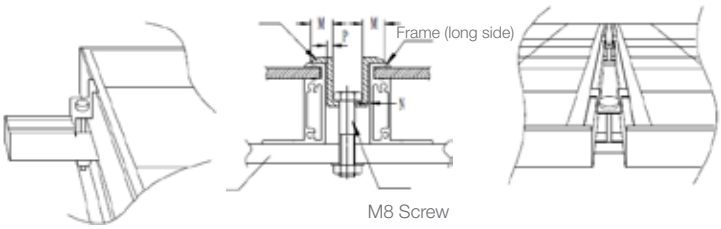
Fringe Modules Installation
Mounting Rail
M8 Screw
Middle Modules Installation

Fig. 3

- Type 2: Short Side Mounting



The movement of the mounting rail and the clamps center-line are recommended to be within the black arrow area. Please find specific data from Table 4.



Fring Modules Installation
M8 Screw
Middle Modules Installation

Fig. 4

Module Type	Cell Type	Cell Quantity	Dimensions (mm)					
			A x B	J	K	M	N	P
JT***SFa/b	Mono	4 x 9	1195×541	50	200	12	0.5~2	2.5~3
JT***SAa/b JT***SAa/b(Black)	Mono	6 x 12	1580×808	50	200	12	0.5~2	2.5~3
JT***SBa/b	Mono	8 x 12	1580×1069	50	200	12	0.5~2	2.5~3
JT***PFe/JT***SFc	Poly/Mono	4 x 9	1482×676	50	200	12	0.5~2	2.5~3
JT***PEe/JT***SEc	Poly/Mono	6 x 8	1324×992	50	200	12	0.5~2	2.5~3
JT***PDe/JT***SDc/ JT***SDc(Black)	Poly/Mono Mono	6 x 9	1482×992	50	200	12	0.5~2	2.5~3
JT***PCe/JT***SCc/ JT***SCc(Black)	Poly/Mono Mono	6 x 10	1655×992	50	200	12	0.5~2	2.5~3
JT***PAe/JT***SAc	Poly/Mono	6 x 12	1956×992	50	200	12	0.5~2	2.5~3

Table 3 (For your information)

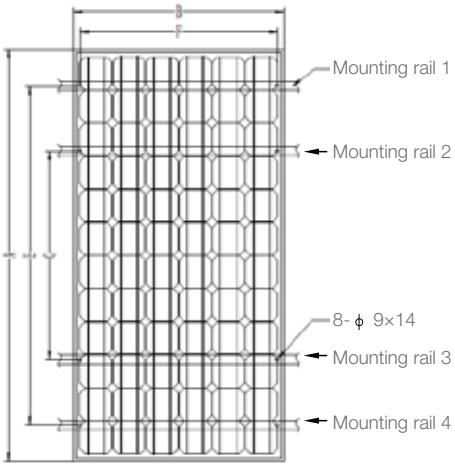
Notes:
1) JT***SFa/b is used as an example.
2) Where "***" is the rated power of the Jetion module.
3) Dimension „N" represents the distance between clamp and frame.
4) Dimension „P" represents the thickness of clamp.

Module Type	Cell Type	Cell Quantity	Dimensions (mm)					
			A x B	J	K	M	N	P
JT***SFa/b	Mono	4 x 9	1195×541	50	200	12	0.5~2	2.5~3
JT***SAa/b JT***SAa/b(Black)	Mono	6 x 12	1580×808	50	200	12	0.5~2	2.5~3
JT***SBa/b	Mono	8 x 12	1580×1069	50	200	12	0.5~2	2.5~3
JT***PFe/JT***SFc	Poly/Mono	4 x 9	1482×676	50	200	12	0.5~2	2.5~3
JT***PEe/JT***SEc	Poly/Mono	6 x 8	1324×992	50	200	12	0.5~2	2.5~3
JT***PDe/JT***SDc/ JT***SDc(Black)	Poly/Mono Mono	6 x 9	1482×992	50	200	12	0.5~2	2.5~3
JT***PCe/JT***SCc/ JT***SCc(Black)	Poly/Mono Mono	6 x 10	1655×992	50	200	12	0.5~2	2.5~3
JT***PAe/JT***SAc	Poly/Mono	6 x 12	1956×992	50	200	12	0.5~2	2.5~3

Table 4 (For your information)

Notes:
1) JT***SFa/b is used as an example.
2) Where "***" is the rated power of the Jetion module.
3) Dimension „N" represents the distance between clamp and frame.
4) Dimension „P" represents the thickness of clamp.

- Option 2: Bolting Mounting
  Each module should secure the frames of module to supporting structure through at least 4 mounting holes (corresponding to the mounting rail 2 and 3). For high wind and snow loads, 8 holes (corresponding to the mounting rail 1 to 4) should be secured. The module frame must be attached to the mounting rails using M8 corrosion-proof screws together with spring washers and flat washers. Recommended torque is 5Nm. Use the exiting installation holes instead of drilling additional holes for installation (Drilling holes is against the reliability and warranty of Jetion modules). Please use corrosion-resistant installation and attachment materials.



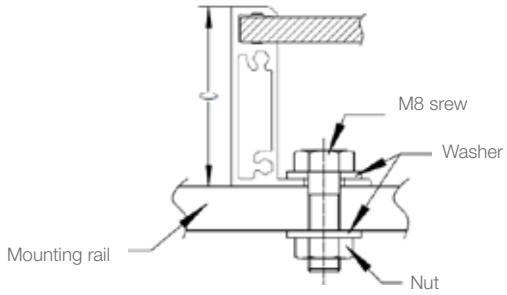


Fig. 5

Module Type	Cell Type	Cell Quantity	Dimensions A x B x C (mm)	Mounting Hole E (mm)	Mounting Hole G x F (mm)
JT***SFa/b	Mono	4 x 9	1195×541x30	960	660x508
JT***SAa/b JT***SAa/b(Black)	Mono	6 x 12	1580×808x40	1300	800x758
JT***SBa/b	Mono	8 x 12	1580×1069x45	1300	800x1019
JT***PFe/JT***SFc	Poly/Mono	4 x 9	1482×676x40	1100	700x626
JT***PEe/JT***SEc	Poly/Mono	6 x 8	1324×992x40	1044	544x942
JT***PDe/JT***SDc/ JT***SDc(Black)	Poly/Mono Mono	6 x 9	1482×992x40	1100	700x942
JT***PCe/JT***SCc/ JT***SCc(Black)	Poly/Mono Mono	6 x 10	1655×992x40	1225	725x942
JT***PAe/JT***SAc	Poly/Mono	6 x 12	1956×992x45	1676	1176x942

Table 5

Notes:
1) JT***SFa/b is used as an example.
2) Where "***" is the rated power of the Jetion module.

4) Grounding

- To avoid the risk of electrical shock or fire, the module frame should be grounded before the electrical connection of the modules is operated.
- The frame shall be grounded in accordance with NEC Article 250 USA or CEC in Canada.
- For an adequate ground, the grounding hardware should penetrate the anodization layer.
- Only UL listed components should be used for grounding.
- Jetion recommends using the following components or equivalents.

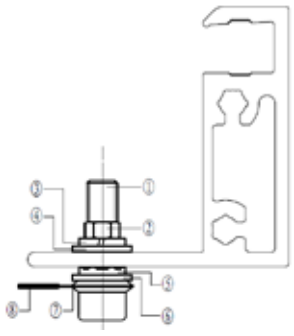


Fig. 6

1 Stainless steel bolt M4 x 30
2 Stainless steel nut M4
3 Stainless steel spring washer M4
4 & 6 Stainless steel flat washer M4
5 Stainless steel lock-toothed washer M4
7 Stainless steel cup washer M4
8 Grounding wire

- Attach a separate conductor as grounding wire to the 4mm diameter grounding holes with a set of M4 bolt, cup washer, flat washer, lock-toothed washer, spring washer and nut.
- Exposed copper of the grounding wire shall not contacts the module frame in case of corroding the frame.

5) Wiring

For the wiring, pay attention to:

- To minimize the risk of indirect lighting strike, avoid forming closed loops when designing the system. Check that wiring is correct before starting the generator. If the measured open circuit voltage (Uoc) and short-circuit current (Isc) different from the specifications, there may be a wiring fault.
- Jetion modules use the J-Box, on the backside of the module, is weatherproof and is designed to be used with standard wiring or conduit connections. Wiring methods should be in accordance to the NEC (National Electrical Code). Bypass diodes and cable clamps are included with each module when shipped from the factory.
- Use modules of the same configurations in the same system. When connected in series, all modules must have the same current. When connected in parallel, the modules must all have the same voltage. The quantity of modules connected should match the voltage specifications of the devices used in the system. The modules must not be connected together to create a voltage which is higher than the permitted system voltage. When designing the Jetion system, please always take into consideration the variation of the voltage under different temperatures (please check the respective temperature coefficients of the modules, the Voc of the modules will be rise when the temperature drops).
- The number of modules in series and in parallel in a system.
- While connecting the modules in series, the total voltage should be less than the maximum system voltage Umax (IEC: Umax=1000V; UL: Umax=600V).
- While connecting the modules in parallel, the total current should be less than the maximum system current.

6) Maintenance and Cleaning

- Do not change the PV components optionally (diode, junction box, plug connectors).
- Given a sufficient tilt (at least 15°C), it is not generally necessary to clean the modules (rainfall will have a self-cleaning effect). In case of heavy soiling (which will result in output reductions), we recommend cleaning the modules using plenty of water (from a hose) with mild detergent and using a gentle cleaning implement (a sponge). CAUTION DON'T USE DETERGENTS CONSISTING OF ABRASIVE, ACETONE OR OTHER CORROSIVE ELEMENTS. Do not clean the modules with cold water during the warmer hours of the day in order to avoid creating any thermal shock that maybe damage the module.

  Dirt must never be scraped or rubbed away when dry, as this will cause micro-scratches. We recommend that the system is being inspected at regular intervals.

7) Checklists

- All fastenings are tight and secure and free of corrosion.
- All cable connections are secure, tight, clean and free of corrosion.
- Cables are not damaged in any way.
- Checking the earthing resistively of metals.

8) Warning

- The maximum load on the module must not exceed 30 lb/ft^2 (146.5 kg/m^2). To avoid exceeding the maximum load, site-specific live loads such as wind and snow should take into account.
- We recommend that the maximum number of modules in parallel should be no more than 2. When more than two modules or strings are planned to be put in parallel, use string fuses. The number of modules in series has to be made according to the max system voltage of the inverter which is being used. However the Voc Voltage of all modules in series should never exceed more than 1000V.
- The plug connector has its own polarity. Make sure that the connection is safe and tight. Ensure that they are in good electrical and mechanical condition.
- The plug connector should not receive external stress.
- Do not attempt to drill holes in the glass surface of the modules.
- Do not drill additional mounting holes in the frame of the modules.
- Do not hoist the module through the J-Box or cable.
- Never use a module with broken glass or torn substrate. Broken modules cannot be repaired and contact with any module surface or frame can lead to electrical shock.
- Do not install or handle modules when they are wet or during the period of high wind.
- Keep children well away from the system while transporting and installing mechanical and electrical components.
- Do not strike or physically damage the module.
- Avoid cutting and damaging the frame and the frontside or backside surface of the module during handling and installation.
- Do not stand or step on the module.
- Do not put extra objects on the module in case of glass broken.
- The J-Box must be on the higher side of the module when it is mounted.

- Do not dismantle or drop the module and do not remove any attached nameplate or components from the module.
- Do not bend or twist the module.
- Do not apply paint or adhesive to module top surface.
- Do not use pointed or sharp objects with the module.
- Artificially concentrated sunlight shall not be directed on the module.
- Precipitation can run off through small openings on the back side of the module. Make sure that the openings are not masked after mounting.
- Do not wearing rings, watches, or metal jewelry during installations.

9) Hazard Warnings

Danger of death from electric shock!

PV modules generate electricity as soon as they are exposed to sunlight. One module generates a safe, extra low voltage level, but multiple modules connected in series (summing the voltage) or in parallel (summing the current) represent a danger. The following points must be noted when handling the solar modules to avoid the risk of fire, sparking and fatal electric shock.

- Do not insert electrically conducting parts into the plugs or sockets!
- Do not fit solar modules and wiring with wet plugs and sockets!
- Exercise utmost caution when carrying out work on wiring and safety equipment (use insulated tools, insulated gloves, etc.)!
- Do not use damaged modules! Do not dismantle modules! Do not mark on the rear of the module using sharp objects!
- Exercise utmost caution when working on wiring and the inverter. Be sure carefully to follow manufacture's installation instructions!

Danger of death from arcing!

Modules generate direct current when light shines on them. An electric arc may be generated when connectors are used to turn the circuit on or off. We therefore recommended covering modules with a lightproof cloth during installation. When breaking a connected string of modules (e.g. when disconnecting the DC line from the inverter under load), a lethally strong arc can occur.

- Never disconnect the solar generator from the inverter while the inverter is connected to the mains grid—remove the fuse from the AC side on the inverter first!
- Ensure the connectors are clean and have not been contaminated and that the electrical connection and mechanical joint are good!

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